

REMARKS

OBJECTIONS TO THE DRAWINGS

The drawings are objected to under 37 C.F.R. § 1.83(a) as failing to show every feature of the invention. New Figs. 10-15 are presented, which are drawn to represent the limitations of claims 1 (Fig. 10), 2-4 (Fig. 11), 5 (Figs. 12-13), 6-7 (Fig. 11), 10 (Fig. 14), 11-16 (Fig. 15), and 19-20 (Figs. 13 and 15) by way of proposed amendments to the drawings, which correspond to the claims. Claims 8-9 and 17-18 are demonstrated by Tables 1-3 of the specification. It is therefore respectfully submitted that the elements of the claims are shown in the drawings. Further, since these drawings are supported by at least the claims as filed, there is no new matter entered. It is believed, however, that the text and formulation of the drawings is also supported by the specification.

The specification has been amended on page 12 to correspond to these new drawings.

Figs. 1-2 are labeled "PRIOR ART", in accordance with the Examiner's request.

FORMAL OBJECTIONS (35 U.S.C. § 112)

The Examiner rejects claims 1-20 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular, the Examiner notes that the specification does not provide substantive detail to a model, characteristic values, transfer functions, algorithms, distributions and means for optimization of transmission lines.

As is well known in the art, a "transmission line" is a structure for transmitting an electromagnetic wave, in which the size of the structure is relatively large with respect to the wavelength of the wave, that is, the wave function will vary at differing portions of the structure. As such, the governing laws of nature, e.g., Maxwell's Equations, etc., completely describe their performance and all details of operation, once the materials and construction are defined. These laws of nature need not be recited in a patent specification in order for it to be enabling, any more than the laws of gravity need be recited in order to understand the operation of an automobile.

For transmission lines with regular geometry, there are well established formulae and equations relating to the wave propagation through the structure. These formulae and equations may include any desired degree of precision and accounting for mechanical tolerances, and, as well known in the art, may be used to describe the transmission process. This description is referred to as a "model".

An "air spaced transmission line" is well known to those skilled in the art as a transmission line having at least two conductors spaced with an air dielectric.

In fact, a basic transmission line according to the prior art is described in the specification, as follows: "Rigid coaxial transmission line systems are assembled from multiple sections of copper line and appropriate connectors."

The specification further states:

Computer Linear circuit simulation or network analysis is the analytical solution for the response of electrical components to an applied stimulus. Transformations of circuit parameters according to Laplace, Thevenin and Norton, allow the generation of transfer functions to create a system of equations. Unknowns are derived by Matrix methods to solve the equations then manipulated to produce s-parameters that completely describe the response of the network ports.

The available engineering analysis programs relieve the Engineer from the solution and presentation or graphics phase, and allows for full concentration on the problem. A library of components, that includes assemblies of components like transmission line sections, is provided to characterize and assemble into a model. When a component is not in the library, s-parameters of an actual physical component can be incorporated into the model as a ported Black Box. Parameters of an elbow, filter or antenna can be added to analyze a complete system. A full understanding of the assembly is required to interpret the parameters and results.

It is well known in the art to employ computer-based models of physical systems and their properties. What is not fully established in the art at the time of the invention, and a part of the present invention, is use of an optimization strategy based on modeled electrical performance for modifying the physical structures of the transmission line in order to achieve a given result or constraints. This optimization is the basis for the present invention.

Applicant provides herewith academic-type references demonstrating that the general characteristics of a transmission line are "textbook" and presented to students in the field for their study. Likewise, after studying these characteristics, an engineer would typically adopt a previously validated computer model of those characteristics, without himself or herself deriving the model, nor even necessarily analyzing the model.

It is respectfully submitted that there is no ambiguity nor issue with respect to the use or interpretation of the objected-to phrases, and that the Examiner provides no evidentiary basis for the alleged lack of enablement, especially in light of the use of the phrases "transmission line" and "air spaced" in the art without further explanation (or apparent confusion), as well as applicant's own background of the invention which makes the intended interpretation quite clear.

The Examiner also points to an alleged failure of applicant to describe structures corresponding to the "means for" language of the claims. A review of claim 1 reveals that each element corresponds to a portion of the standard-type computer described in the specification:

The analysis of the present model-based solution uses, for example, 1000 or more frequency points, in order to include the narrow VSWR spikes over the band of interest. Of course, a different number of frequency points may be employed. A Pentium II-based workstation running Microsoft Windows NT 4.0, having a clock rate of at least 400 MHz, is preferred, as each component is adjusted approximately 10 times.

Thus, the two "means for storing" elements correspond to the memory within the workstation (for example, locations of cache memory within the Pentium II processor), while the "means for adjusting" corresponds to the CPU within the Pentium II processor.

It is well known in US patent practice to describe elements of a general purpose computing platform in means-plus-function format. However, applicants have also submitted new claims 21-25 which avoid this language and instead adopt express language to describe the element, without resort to the specification.

A transfer function is well known to be a mapping of input to output, for example defining the changes to a signal passing through the structure. It is respectfully submitted that this phrase is in no way indefinite.

The phrase "may be defined" in claim 1 is not indefinite. Claim 1 defines a "model". The model itself is claimed without requiring its use in analytic operation, which, of course, is a principal difference between an apparatus and a method type claim. Thus, the terminal clause in claim 1 discusses a capability of the model, and thus serves as a true limitation thereon. Replacement of the phrase "may be defined" with "is defined" would be quite improper, and

indeed this aspect varies for different transmission line architectures to be modeled, leading to a potential paradox is the concrete language were employed.

Claims 8 and 17 define that the respective characteristic values are “substantially non-incrementally distributed across a range”. This refers to the fact that the selection of the characteristic values is not intended to be, nor would it result in, an incremental distribution. This means that there is no a priori or hidden assumption that an even (or incremental) distribution is a target result. It is respectfully submitted that these claims are not indefinite.

Likewise, Claims 9 and 18 define that the respective characteristic values are “substantially non-monotonically distributed across a range”. This refers to the fact that the selection of the characteristic values is not intended to be, nor would it result in, a monotonic (meaning with successive increases or decreases) distribution. This means that there is no a priori or hidden assumption that the order of the segments is in “size order” as a target result. It is respectfully submitted that these claims are not indefinite.

Claims 19 and 20 are respectfully submitted to be proper product-by-process claims, which clearly define the claim scope and are not indefinite. Each of claims 19 and 20 define a product with express characteristics, produced by the process of the independent claim.

The Examiner has rejected the under 35 U.S.C. § 112, second paragraph as being “incomplete for omitting essential elements, such omission amounting to a gap between the elements”. 35 U.S.C. § 112, second paragraph, requires that “[t]he specification ... conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” Indeed, applicant has complied with this requirement. The various elements of claims 1 and 10 are interconnected, and clearly define the scope of claim to which applicant believes he is entitled. The claims, while broad, are distinct

and comprehensible, as well as *complete*. In contrast to the Examiner's insinuation, there are no gaps in the claims. In particular, it is not believed necessary to claim the details or elements necessary for carrying out the optimization. Any optimization method or apparatus now known or in the future envisioned may be applied to solve the problem at hand. According to the present invention, novelty and non-obviousness reside in the presentation of the problem in such manner that a variety of optimization schemes and systems may be readily applied.

Applicant agrees that the use of the phrase "transfer function" without limitation is not limited to an "s-parameter matrix".

Applicant is, however, at a loss to understand how the phrase "air-spaced transmission line" can be a statement of intended use. This is clearly a structural limitation well understood by those of ordinary skill in the art to encompass a transmission line in which air is employed as a dielectric to space conductors.

ART REJECTIONS (35 U.S.C. §§ 102-103)

Claims 10-11 and 13-20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fleming-Dahl US 5,218,326. The '326 patent relates to a mathematical method for defining a set of coaxial cable lengths, in monotonic order, which operates in the abstract on pure numbers representing lengths to achieve a desired set of relative lengths. At no time during the optimization of the cable lengths is the electrical performance of the segmented transmission line modeled, nor is the model evaluated.

Therefore, the reference fails to anticipate the present claims. Likewise, the results of the use of the method according to the present invention differ from those of the '326 patent, and

there is no reason to conclude that any arbitrary optimization procedure would produce a similar result to that of the '326 patent, indicating that this procedure is not "optimum".

Claims 1-9 and 12 are rejected under 35 U.S.C. § 103(a) as being obvious over the '326 patent in view of Huss. The Examiner admits that Fleming Dahl fail to disclose a transfer function, for which Huss is cited. In contrast to the Examiner's statement that it would have been obvious to combine Fleming Dahl and Huss, it is not seen that the combination has any logic or motivation.

How is the transfer function of Huss applied to the component lengths defined by Fleming Dahl? If one were to model the transfer function of a single segment of the transmission line or multiple segments of the line, how is this model used to influence the process for selecting cable lengths? The Examiner, for some reason, focuses on "component manufacturing tolerances" by bolding this text. Are these tolerances relevant to the application of a transfer function?

The scheme according to Fleming-Dahl fails to determine an effect of segment sequence, as required by claim 1, and indeed provides no motivation therefore. Note that the size of ordered transmission line segments in the '326 patent monotonically increases. In contrast, according to the present invention, the sequence of lengths is an intrinsic factor in the optimization, and need not be, and generally will not be, monotonic.

The prior art fails to teach or suggest the application of a complex aggregation of transfer functions of transmission line segments to formulate a model of the complete system, and then employ an optimization algorithm to adjust a "characteristic value" of the respective line segments to achieve a desired system response.

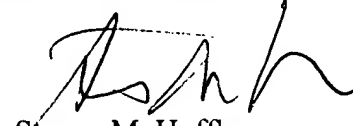
While the Examiner might argue that "optimization" of a physical system is always obvious, this is simply not the case, especially where computational complexity is an issue. The reason is that, for runs with only a few line segments, the issues were readily solved using trial and error or other known techniques, and for complex systems having many line segments, the modeling problem was considered intractable. Applicant, however, found that this approach was indeed effective, and provided new and useful results.

It is therefore respectfully submitted that the present application is allowable.

Respectfully submitted,

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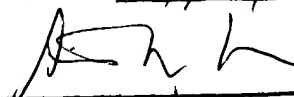

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